

Appl. No. 10/045,004  
Amendment dated: June 15, 2004  
Reply to OA of: March 23, 2004

### **REMARKS**

Applicants have amended the claims in order to more particularly define the invention taking into consideration the outstanding Official Action and to place the application in early condition for allowance or at least better form for appeal. Claim 1 has been amended to incorporate the limitations from claims 2 and 5 therein. This amendment does not introduce new issues into the prosecution of this application and therefore, it is most respectfully requested that this amendment be entered.

Claims 2, 5 and 7-9 have been canceled from the application without prejudice or disclaimer. The claims now remaining in the application are claims 1, 3-4 and 6. Applicants most respectfully submit that all the claims now present in the application are in full compliance with 35 U.S.C. §112 and are clearly patentable over the references of record.

The rejections of claims 1, 4 and 7 under 35 U.S.C. §103 as being unpatentable over JP 2000141078 and Claims 7-9 as being unpatentable over U.S. 6,319,461 to Domi have each been obviated by the amendment to the claims as neither claims 2 nor 5 are included in these rejections and these limitations have been added to claim 1. Accordingly, it is most respectfully requested that these rejections be withdrawn.

The rejection of claims 1-9 under 35 U.S.C. §103 as being unpatentable over JP 2000015478, has been carefully considered but is most respectfully traversed in view of the further amendments to the claims.

It is urged in the Official Action that the cited reference disclose the features including the claimed Pb-free solder composition. The features relied upon described on page 2 of the Official Action can be found in the references at : abstracts. The difference between the references and the claims are as follows: cited references contains additional alloying elements.

It is further stated on page 3 of the Official Action that when prior art compounds essentially "bracketing" the claimed compounds in structural similarity are all known, one of ordinary skill in the art would clearly be motivated to make those claimed

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compounds in searching for new products in the expectation that compounds similar in structure will have similar properties.

Therefore, the Examiner concludes that it would have been obvious to one of ordinary skill in the art to select any portion of range, including the claimed range, from the broader range disclosed in a prior art reference because the prior art reference finds that the prior art composition in the entire disclosed range has a suitable utility.

As presently amended claim 1 relates to a lead-free solder consisting essentially of 7.0-10.0 wt% of zinc, 0.1- 4 wt% of silver, 0.25-0.5 wt% of aluminum, 0.1-4.0 wt% of Ga and the remainder tin. As correctly noted by the Examiner, the inclusion of the transition phrase, "consisting essentially of" limits the claim and excludes components which adversely affect the properties of the composition. The claims now present in the application relate only to a five component lead-free solder alloy composition. The lead-free solder alloys of the present invention have better tensile strength and elongation than the conventional tin-lead solder alloys. In addition, the lead-free solder alloys of the present invention have a melting point lower than 200°C, which is close to the 183.5°C of a eutectic tin-lead alloy.

In this regard, the following statement is made by one of the co-inventors of the presently claimed invention, Dr. Kwang-Lung LIN: "It was found in this present invention that the addition of Ag (e.g., 0.5 wt%) and GA (e.g., 0.5 wt%) greatly enhances the tensile strength from 75.7 MPa of Sn-8.55, Zn-0.45 and Al to 93.9 MPa. The hardness from 16.7 HV to 25.2 HV. The addition of Ag and Ga can further lower the melting temperature from 198°C of Sn-8.55Zn-0.45Al to 194.7°C at 0.5 wt% Ag and 0.5 wt% Ga. The addition of Ga and Ag enhances the oxidation resistance of the Sn-8.55Zn-0.45Al." It is believed that this statement clearly establishes the patentability of the claimed invention and a 132 declaration to this effect can be presented if the Examiner believes that this will place the application in condition for allowance.

In this regard, the Examiner's attention is again most respectfully directed to the experimentation contained in the specification including the control examples set forth on page 4 and the various compositions of the invention described in Examples 1

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through 5. The unique combination of properties exhibited by the claimed invention may be seen from these Examples and particularly the associated Figures. Thus, by evidence of record, the features of the claimed invention are clearly demonstrated per the claimed invention which is not suggested from the prior art as would be appreciated by one of ordinary skill in the art to which the invention pertains.

Applicants also most respectfully direct the Examiner's attention to MPEP § 2144.08 (page 2100-114) wherein it is stated that Office personnel should consider all rebuttal argument and evidence presented by applicant and the citation of *In re Soni* for error in not considering evidence presented in the specification.

The most important point in designing a new solder does not reside in the elemental contents of the alloy but in the combination of the elements that exhibit improved properties. The cited '478 patent is directed to an alloy having an improvement in the stability of the tin-zinc pewter at the time of preparing to a solder paste and aging of the tin-zinc pewter after junction can be suppressed (English translation, paragraph [0009]). The composition of this prior art alloy is an Sn-based alloy containing 3-21% Zn, and less than 0.5% of an additional element selected from Be, Mg, Ca, Sr, Ba, Mn, Ga, In, Ta, P, Sb, Bi, S, Se, Te, and Po. Other examples include Sc, Y, La, Ti, Zr, Cr, Fe, Co, Ni, Cu, Ag, B, Al, Si. Among the examples disclosed in this prior art the closest alloy is 91% Sn, 8.5% Zn and 0.5% Al prepared in Example 9 [paragraph 0050].

However, Applicants most respectfully submit that there is no motivation from the reference to make the necessary selection to arrive at the presently claimed invention. "In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972). Applicants most respectfully ask, how can one obviously conceive the present invention having an improved wetting and mechanical properties from thousands possible choices taught

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by this prior art? These properties are part of the invention as a whole. They must be taken into consideration in evaluating the patentability of the claimed subject matter. They simply cannot be ignored.

The referenced patent '478 listed "additional component" yet failed to point out the particular properties achieved by the present invention. Applicants most respectfully submit that the Examiner must have further evidence before a prima facie case of obviousness is established to reject the claims now remaining in the application over the '478 patent. In re Fritch, 23 USPQ 1780, 1784(Fed Cir. 1992) ("It is impermissible to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.). Accordingly, it is most respectfully requested that this rejection be withdrawn.

In view of the above comments and further amendments to the claims, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

Respectfully submitted,

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